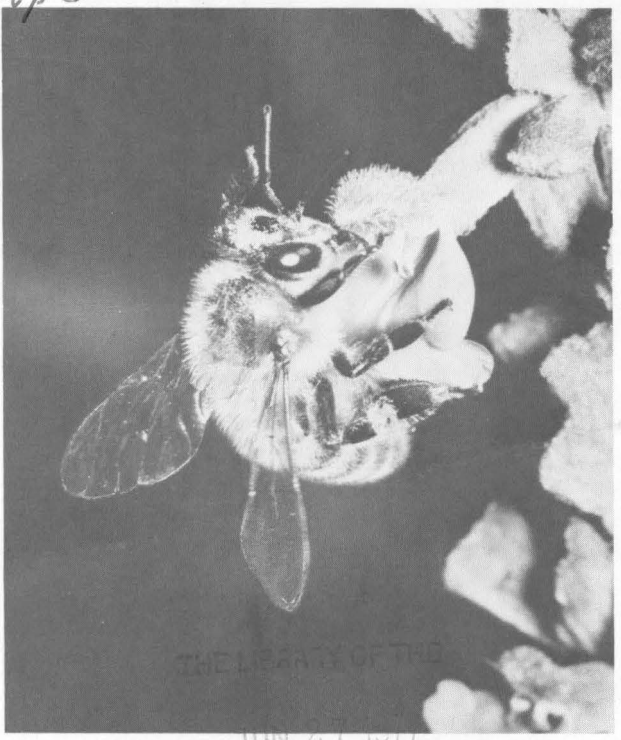

Pesticides and Honey Bees

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MANY PESTICIDES that are necessary in crop production are highly toxic to honey bees. Properly used, the materials benefit both beekeepers and farmers by providing healthier plants that produce more food for bees, livestock, and people, instead of being damaged or eaten by pests. Bee losses from pesticides cannot be entirely avoided, but they can be minimized by the cooperative efforts of spray operators, beekeepers, and farmers.

Where to start

Proper dosages of pesticides and adherence to the recommendations on the label are the first considerations in preventing losses of bees as well as avoiding injury to people and farm animals. Do not apply highly toxic materials to any flowering plants on which honey bees are working. If an application must be made, consider moving the bee colonies or using better timing and less toxic materials so that insect pests can be controlled with less danger to bees.

Methods of application

Ground application of pesticides is generally safer for bees than air application. The hazard from air application may be somewhat reduced by not turning the aircraft above blooming crops or transporting materials across them. The hazard to honey bees is increased by applications of pesticides to large areas, as in the control of grasshoppers, mosquitoes, armyworms, gypsy moths, and corn rootworm beetles, and by repeated applications to limited areas.

Selection of materials

The formulation of the material plays an important role in its toxicity to bees. In general, sprays are safer than dusts, and emulsifiable concentrates are less toxic than wettable powders. Granular materials and soil treatments are usually not harmful to bees. The hazard to bees apparently increases when insecticides are microencapsulated. The minute capsules can be carried back to the colony in the same manner that pollen is carried, and can kill brood and young adult bees. At present there are no safe, effective repellants that will keep bees away from treated areas.

Fungicides, acaricides (miticides), herbicides, and blossom thinners are relatively nontoxic. These materials and the insecticides can be divided into three groups according to their effects on bees.

Highly toxic. These materials kill bees on contact during application and for one or more days after treatment. Bees should be moved from the area if highly toxic materials are used on plants the bees are visiting. Materials in this group include:

aldicarb (Temik)
arsenicals
azinphosethyl (Ethyl Guthion)
azinphosmethyl (Guthion)
Azodrin
BHC
Bidrin
Bomyl
carbaryl (Sevin)
carbofuran (Furadan)
chlorpyrifos (Dursban, Lorsban)
diazinon
dichlorvos (DDVP, Vapona)
dimethoate (Cygon, De-Fend)
EPN
famphur (Famophos)
fensulfothion (Dasanit)
fenthion (Baytex)
Gardona
heptachlor
Imidan, Prolate
lindane
malathion, dilute[a]
malathion, low volume
Matacil
Mesurol
Metacide
methomide (Monitor)
methomyl (Lannate, Nudrin)
methyl parathion (Penncap-M)
Methyl Trithion
mevinphos (Phosdrin)[b]
Mobam
naled (Dibrom)[b]
parathion
phosphamidon (Dimecron)
propoxur (Baygon)
Zectran
zinophos

[a] Kills bee primarily on contact.
[b] Short residual activity. Can usually be applied safely when bees are not in flight. Do not apply over hives.

Moderately toxic. These materials can be used with limited damage to bees. They should not be applied over bees in the field or at the hives. Correct dosage, timing, and method of application are essential. This group includes:

Abate
Banol
carbophenothion (Trithion)
chlordane
Ciodrin
DDT
demeton (Systox)
disulfoton (Di-Syston)
endosulfan (Thiodan)
endothion
endrin
formetanate (Carzol)
methyl demeton (Meta Systox)
mirex
oxydemetonmethyl (Meta Systox R)
Perthane
phorate (Thimet)
phosalone (Zolone)
Pyramat
ronnel (Korlan)
tartar emetic

Relatively nontoxic. This group includes the greatest number of materials. They can be used around bees with few precautions and little injury to bees. Some of the more common materials in this group are:

allethrin
Aramite
Bacillus thuringiensis
binapacryl (Morocide)
Bordeaux mixture
captan
chlorbenside
chlorobenzilate
ferbam (Fermate)
folpet (Phaltan)
Galecron, Fundal
glyodin
maneb
methoxychlor
Morestan
nabam

chloropropylate
copper compounds
cryolite
Dessin
dicofol (Kelthane)
Dilan
Dimite (DMC)
dinitrocyclohexylphenol (DNOCHP)
dinocap (Karathane)
dinoseb (Premerge)
dioxathion (Delnav)
dodine (Cyprex)
Dyrene
ethion
fenson
nicotine
Omite
ovex
Plictran
Polyram
pyrethrum
rotenone
sabadilla[a]
Strobane
sulfur
Sulphenone
tetradifon (Tedion)
toxaphene
trichlorfon (Dylox, Proxol)
zineb
ziram

[a] Twenty-percent dust may cause bee losses.

Time of application

With proper timing, moderately toxic materials can be used on crops visited by bees. Applications can be made between 7 p.m. and 7 a.m., when bees are not usually foraging. Evening is a safer time than early morning. However, applications should not be made over or near apiaries on hot nights when bees may be clustered on the hives. Adjustments in timing may also be necessary on warm mornings when bees are flying earlier than usual. Some crops such as sweet corn and cucurbits (melons, squash, pumpkin) shed pollen early in the day. By 4 p.m. they no longer attract bees. Pumpkin blossoms may close by midmorning.

Plants that may present problems

Treatments that include any of the following crops and wild plants may create bee poisoning problems:

— Legume seed crops in bloom (sweetclover, red clover, alfalfa).

— Cucurbits in bloom (squash, cucumber, cantaloupe, watermelon, pumpkin).

— Vegetable seed crops in bloom (onion, carrot, asparagus).

— Cut-flower and flower seed crops in bloom.

— Cover crops in bloom beneath orchard trees (white clover, chicory, dandelion).

— Weeds in bloom in grain fields (mustard).

— Sorghum and corn, especially sweet corn, when shedding pollen.

— Soybeans in bloom after July 15.

— Cotton throughout the season (blooms and extrafloral nectaries).

Other hazards to bees

Although most bee losses occur when bees visit treated blossoms, losses may also occur when bees collect water or honeydew (sweet insect secretions) from foliage or other objects in the treated area. Pesticides drifting over apiaries or onto blooming nontarget crops may be just as lethal as if applied directly.

Exchange of information

Preventing bee losses is the joint responsibility of the spray operator, the farmer, and the beekeeper. Prevention is fostered by mutual understanding and cooperation, including the exchange of information before pesticides damaging to bees are used. Prior notice to the beekeeper is essential so that he can protect or move his colonies. Often the bees cannot be moved because of wet ground, the weight of individual colonies, or the lack of alternative apiary sites.

The beekeeper's obligation

The beekeeper's responsibility for preventing pesticide damage to his bees begins when he establishes an apiary, either permanently or for crop pollination. He should familiarize himself with the cropping practices in the area and the pest-control methods in use. In some cases he can *expect* damage to his bees and must weigh the risk against the anticipated returns from honey or pollination fees. Pest-control operations in orchards and on sweet corn, lima beans, and cotton have made many areas off-limits to bees. Bees for fruit pollination should be held in locations away from the orchards until prebloom spraying is completed and trees are 10 to 25 percent in bloom. Bees should be moved out of the orchard after three or four days of good pollinating weather, but before application of the calyx sprays at petal fall.

In emergency situations bees can be confined to their hives for short periods. This is practical only if materials with short residual toxicity must be applied when bee hives are in the field or close by. Loose-fitting covers are placed over the hives during the night or early morning when the bees are not flying. The covers are removed two or three hours after the application, or at least by midmorning. Black polyethylene sheeting is most commonly used, but burlap is better if the colonies are not directly exposed to the spray. Confinement for longer periods — a day or more — is possible if the burlap covers are kept damp. These methods are suitable only for small numbers of colonies or in cases of dire emergency.

A beekeeper should always give his name, address, and telephone number to owners of land on which the apiaries are located so he can be notified of farm operations affecting his bees. All apiaries should be identified by a placard bearing the owner's name, address, and telephone number in letters legible at a distance of 50 feet or more. Such signs often deter vandalism and are valuable when people wish to contact the apiary owner.

The increasing complexity of farming puts additional responsibility on the beekeeper. He should be familiar with commonly used pesticides and their toxicity to bees. He should also know as much as possible about the relations of his bees to the nectar and pollen plants in his territory. The beekeeper must be aware, for example, that bees collect pollen on corn and melons primarily in the morning. He should also expect to find bees visiting soybean blossoms in July and August, when other legumes become less attractive. Only with such information can he take an active part in minimizing losses of bees from pesticides.

Additional sources of information

County extension advisers and extension specialists in apiculture and entomology can provide additional information about honey bees and pesticides. The following publications cover the subject of bees and pesticides from all aspects and were used in preparing this circular:

Atkins, E. L., Jr., et al. Protecting honey bees from pesticides. Division of Agricultural Sciences, University of California Leaflet 2883. 1976.

Johansen, Carl A. How to reduce poisoning of bees from pesticides. Washington Cooperative Extension Service EM 3473 (SR). 1975.

U.S. Department of Agriculture, Agricultural Research Service. Protecting honey bees from pesticides. Leaflet 544. 1972.

This circular was prepared by Elbert R. Jaycox, Professor of Apiculture. It replaces Circular 940.

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